

Notes on Banana Varieties in Hawaii

N. W. SIMMONDS¹

KNOWLEDGE OF THE BOTANY of the banana has been advanced considerably in recent years by the taxonomic researches of Cheesman (1947 *et seq.*). It is now clear that the edible bananas have originated from three wild species of which one, *Musa acuminata* Colla, is by far the most important. This species belongs to the section Eumusa of the genus *Musa* and is a variable (but constantly diploid) species with $2n=22$ chromosomes. Many edible varieties have derived from it, some being diploid, some triploid ($2n=3x=33$). *Musa balbisiana* Colla is another diploid Eumusa, and it has contributed to the origin of edible bananas by hybridity with *M. acuminata*. Upon triploid cultivars of such hybrid origin were founded the two Linnaean species *Musa sapientum* and *M. paradisiaca*. (This statement includes a modification of Cheesman's views on the subject, but the point is immaterial for the present purpose.) The third species (following MacDaniels, 1947, rather than Cheesman, 1949) is *M. troglodytarum* L., the fe'i banana of the Pacific, perhaps more commonly referred to as *M. fehi* Bert. ex Vieillard. It is a member of the section Australimusa and is diploid with $2n=2x=20$ chromosomes. The wild progenitor of this complex cultigen has not yet been identified, and, indeed, it may well turn out that more than one wild form was involved in its origin. The section Australimusa is still very poorly known taxonomically, and, until this deficiency is remedied, we are not likely to understand the variability or origins of the fe'i banana, as it may conveniently and noncommittally be called.

Edibility, therefore, has had independent origins in different sections of the genus (Cheesman, 1947, 1948; Dodds, 1946).

The wild bananas are all native to tropical Asia and Australasia, and the edible derivatives must have had their origins somewhere in that vast area. Malaya was almost certainly the home of some edible Eumusas; the fe'i banana presumably came from an area much farther south and east, in the islands where the wild Australimusas grow. Spread in cultivation must have been entirely by suckers after the process of evolution of parthenocarpy had gone far enough to impose seed sterility (Dodds and Simmonds, 1948), and it must have been by this means that Hawaii received her cultivated bananas. Once seed sterility has been established in a crop plant (or rigorous vegetative propagation is practised), somatic mutation is the only source of genotypic variability. Such mutation, or sporting, is well known to occur in bananas (e.g., see Baker and Simmonds, 1951; Simmonds, 1953) and has been a significant source of variability among the old Hawaiian varieties as Pope (1926), by classifying the Hawaiian varieties in groups, implicitly recognised. Evidently the Hawaiian cherished the mutants as he cherished mutant forms of taro and cane.

In Hawaii, as elsewhere in the Old World tropics, two banana cultures are superposed one on the other: an indigenous pre-European culture of bananas introduced, used, and named by the Hawaiian people; and a later culture of varieties introduced in recent times by Europeans. The two groups may conveniently be called "Hawaiian" and "alien," respectively, and with the foregoing remarks in mind we may proceed to an annotated list

¹ Banana Research Scheme, Imperial College of Tropical Agriculture, Trinidad, British West Indies. (Abbreviated in the text as I.C.T.A.) Manuscript received August 11, 1953.

of the varieties that the writer was able to examine in Hawaii. These remarks take the form of footnotes to Pope's (1926) list, with emphasis on observations that, in the light of recent researches, seem to be botanically important.

HAWAIIAN VARIETIES

Popoulu. An *acuminata-balbisiana* hybrid (hereinafter abbreviated to AB) type, probably triploid. Plant flushed with red and bracts curled (*acuminata* characters); flowers pale pink, ovules four-rowed (*balbisiana* characters). Fruits short and very fat, superficially disguising the true relationship of the variety.

Maiaoli. Botanically much like Popoulu, but plant pale in colour and fruits longer and more slender although blunt at the tip. **Aeae (Koae)** is a striped mutant; at least five shades from near white to dark green could be detected, and a probable case of striped to normal mutation was seen. It is probably chimerical. **Kaualau** is perhaps a mutant with slightly persistent bracts, **Eleele** one with purple-brown staining on sheaths and midribs. Only extensive collection and experimental comparison could resolve the confusion of varieties, mutants, and names in this complex.

Iholena. Probably an *acuminata* edible type. The fruit has a very characteristic thick skin and pinkish flesh. Little material was seen, and no probable bud sports were recorded.

Maiaoa ("Wild banana"). A strain of the variable *Musa acuminata*, diploid, fully seeded, and quite inedible. Apparently related to the Malayan form of the species. The history of and reason for introduction of the plant to Hawaii is unknown. It has long been in cultivation in the I.C.T.A. banana collections. The plant was only seen once (near Kona), and, since local knowledge of its existence had apparently been lost, the rediscovery was of some interest.

ALIEN VARIETIES

Borabora. The *fe'i* banana. MacDaniels (1947) discussed the hypothesis that the *fe'i* banana was present in Hawaii in aboriginal times but concluded (as did Pope, 1926) that it was not brought to Hawaii before the early nineteenth century and was not one of the plants cultivated by the early Hawaiians.

The writer saw little material and no useful observations on variability could be made. The chromosome number was confirmed as $2n=20$ on two plants taken near Honolulu (counts by K. Shepherd). It is never known to be seed-fertile in Hawaii (St. John, personal communication), although it does occasionally set seed elsewhere in the Pacific (MacDaniels, 1947) and is always at least slightly pollen-fertile (MacDaniels, personal communication). Presumably, the species is always diploid (though sometimes perhaps chromosomally abnormal, as is *M. acuminata*), and the variable incidence of total seed sterility is to be related to a variable incidence of sterility modifiers of parthenocarpy.

Cavendish, or Chinese. A triploid form of *M. acuminata* and one of the most important and widely cultivated banana varieties in the world. It is one of a complex series of bud sports referred to collectively as the Cavendish group and treated exhaustively elsewhere (Simmonds, 1953). It is an important export variety in some areas and used to be of some significance in Hawaii as such. It is highly susceptible to leaf spot (Sigatoka) disease, which is, however, fortunately absent from the Territory.

Hamakua. A variety introduced from Hawaii to the I.C.T.A. in 1939 under this name proved to be identical with the **Lacatan** of Jamaica, etc. This is another member of the Cavendish group, related by mutation to the preceding although utterly different in general aspect. Numerous plants were seen on the Kona coast of Hawaii,

but search in the same locality for another mutant form, the **Robusta** of Jamaica (Simmonds, 1953), was unsuccessful; this latter variety is probably present in the Territory, however, since it was once introduced to the I.C.T.A. under the wrong label, **Manaiula**, a name applied to a native Hawaiian variety which it does not in the least resemble. As Pope suggests that **Hamakua** is the same as the West Indian variety **Congo**, it may be worth noting that **Congo** in the I.C.T.A. collections is identical with **Robusta**, not with **Lacatan**.

Bluefields, Gros Michel. (**Pisang Embon** of Malaya, etc., etc.) This is another edible triploid *Musa acuminata* and the principal export banana of commerce. It is much favoured as a dessert banana in Hawaii, but its cultivation is severely restricted by the incidence of Panama disease to which the variety is highly susceptible. It is also very susceptible to leaf spot, and successful cultivation in the Caribbean area demands regular spraying.

Brazilian. An AB-type triploid; material introduced to the I.C.T.A. in 1939 proved to be identical with a variety called **Pome** from the Canary Islands. The sometimes misshapen male bud with a few persistent bracts just above it is characteristic. The fruit is subacid and of poor quality; it has little to recommend it as a dessert banana (to a West Indian trained taste, at least), and its acceptance in Hawaii seems to be a good example of the power of need and habit in influencing the demands of a market. It is resistant to Panama disease and to leaf spot.

Lady's Finger. As usual, this name is applied indiscriminately to almost any banana with small fruits. The writer recorded it for two varieties in Hawaii, namely: the **Sucrier** (of Trinidad, **Honey** of Jamaica, etc.), a diploid *acuminata* with yellowish, nonwaxy foliage and small thin-skinned fruits; and another variety called **Ney Poovan** (from Madras) in the I.C.T.A. collections, an

AB-type diploid. The former is resistant to Panama disease but is very susceptible to leaf spot; the latter is resistant to both diseases. Pope's remarks under the name **Lady Finger** seem to apply to **Ney Poovan**.

Apple. This is another unfortunate name, as it is commonly applied to several AB-type varieties having subacid fruits. In Hawaii it was applied to a variety thought to be the **Silk Fig** (of Trinidad, **Apple** of Jamaica, an AB-type triploid) but sometimes also to **Brazilian**, a distinct although not dissimilar variety (see above). In Trinidad, **Silk Fig** is susceptible to Panama disease but resistant to leaf spot.

Ice Cream. Pope's description suggested a variety unrepresented in the I.C.T.A. collections, and so it turned out. Plants were seen at Honolulu and Kona, their scarcity suggesting that this is not a particularly favoured variety. Plant small and densely stooling; peduncle glabrous; bud of hybrid type; bracts curled, red within to base; male flowers red; fruit angular, grey-waxy, flesh soft and sticky; ovules 4-rowed. An AB-type hybrid but perhaps nearer to *M. balbisiana* than is usual among dessert bananas and, therefore, of considerable interest. Arrangements are in train to import it to the I.C.T.A. for detailed study.

Red, and its green bud-sport **Green Red**. As in the West Indies. The former is probably chimerical, having a red skin over a green core; various fleckings and stripings are common.

Miscellanea. Several varieties named by Pope were not seen by the present writer but are worthy of some comment. The **Common Plantain** is probably the same as the **Horse** or **Horn Plantain** of the West Indies; it differs from other members of the plantain complex in having a quickly degenerating male axis and comparatively few large horn-shaped fruits. Pope's description of **Largo** suggests the popular West Indian cooking variety called **Blug-**

goe (Grenada), Moko (Trinidad), White-house Plantain (Jamaica), etc. Colorado Blanco is probably Green Red. Three other varieties described by Pope cannot certainly be identified at present; they are Eslesno, Chamaluco, and Father Leonore, and all three are probably AB hybrids. Father Leonore may be the same as the I.C.T.A. variety King. Pope's description and photograph of Abaca unquestionably apply to *M. balbisiana* Colla, not to *M. textilis* Nee; this mistake has often been made and probably results from the fact that *M. balbisiana* is a common rogue in Abaca fields in the Philippines and has been widely distributed thence as true Abaca. (Cheesman, 1949.)

ACKNOWLEDGMENTS

The writer's visit to Hawaii was made possible by the generous gift of a grant-in-aid by the Carnegie Corporation of New York; his most sincere thanks are due the Corporation and the numerous people who assisted him in various ways while in the Territory.

REFERENCES

- BAKER, R. E. D., and N. W. SIMMONDS. 1951. Bananas in East Africa. I. *Empire Jour. Expt. Agr.* 19: 283-290.
- CHEESMAN, E. E. 1947. Classification of the bananas. *Kew Bul.* 1947: 106-117.
- 1948. Classification of the bananas. *Kew Bul.* 1948: 11-28, 145-157.
- 1949. Classification of the bananas. *Kew Bul.* 1949: 265-272, 445-449.
- DODDS, K. S. 1946. *Musa febi*, the indigenous banana of Fiji. *Nature [London]* 157: 729-730.
- and N. W. SIMMONDS. 1948. Genetical and cytological studies of *Musa*. IX. *Jour. Genet.* 48: 285-296.
- MACDANIELS, L. H. 1947. A study of the fe'i banana and its distribution with reference to Polynesian migrations. *Bernice P. Bishop Mus., Bul.* 190. i+56 pp., 15 figs., 10 pls.
- POPE, W. T. 1926. Banana culture in Hawaii. *Hawaii Agr. Expt. Sta., Bul.* 55: 1-48, 17 pls.
- SIMMONDS, N. W. 1953. Varietal identification in the Cavendish group of bananas. *Jour. Hort. Sci.* (In press.)